March 26, 1940. M. C. STEINMUELLER 2,194,485

REVERSE PLATING KNITTING MACHINE

Filed June 8, 1928 4 Sheets-Sheet 1

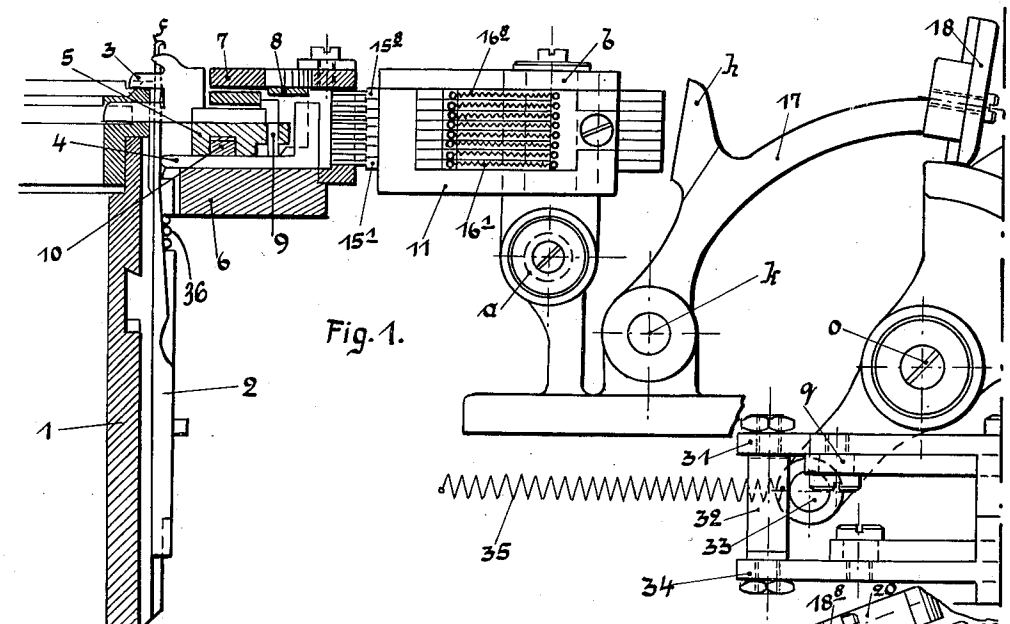


Fig. 1.

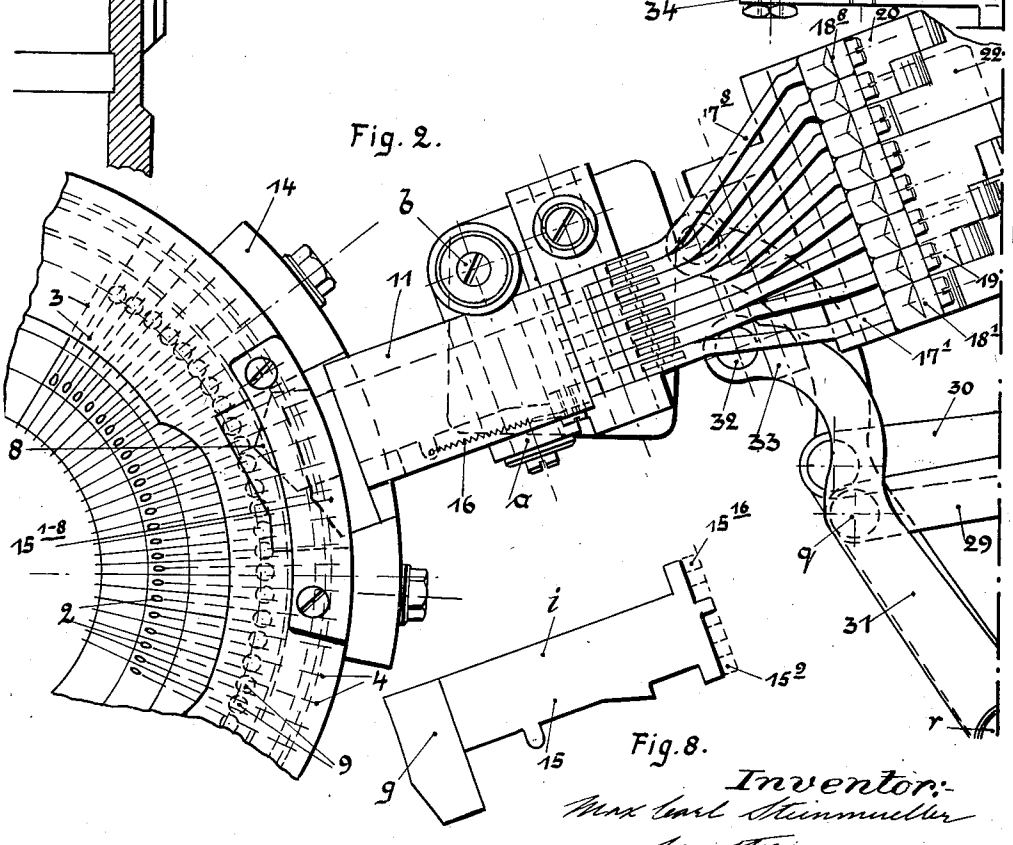


Fig. 2.

Fig. 8.

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March 26, 1940. M. C. STEINMUELLER 2,194,485

REVERSE PLATING KNITTING MACHINE

Filed June 8, 1928 4 Sheets-Sheet 2

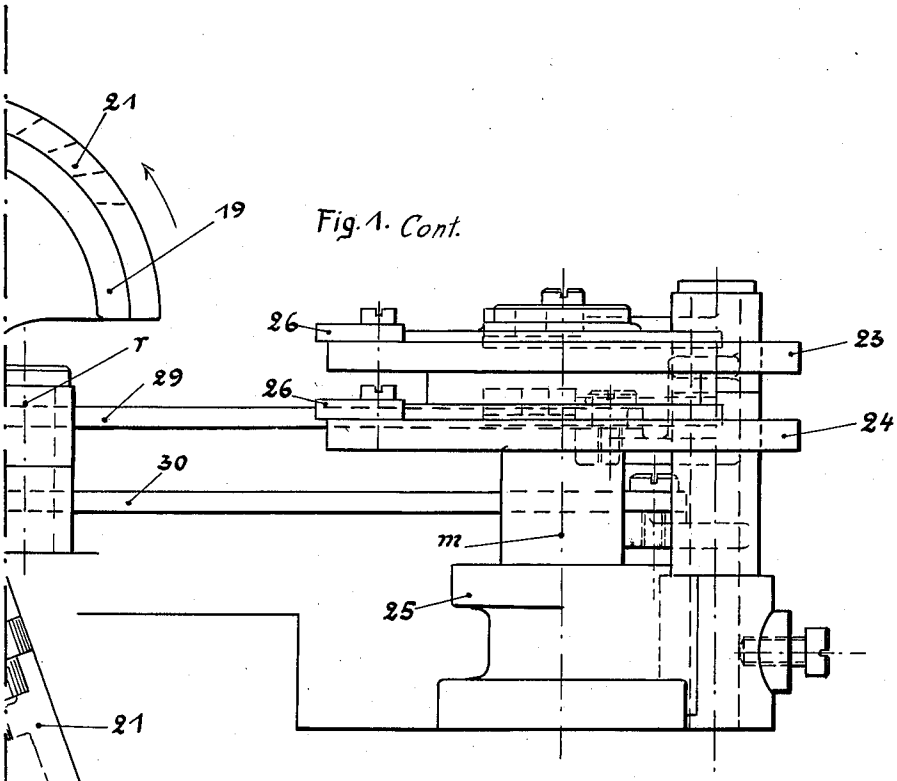


Fig. 1. Cont.

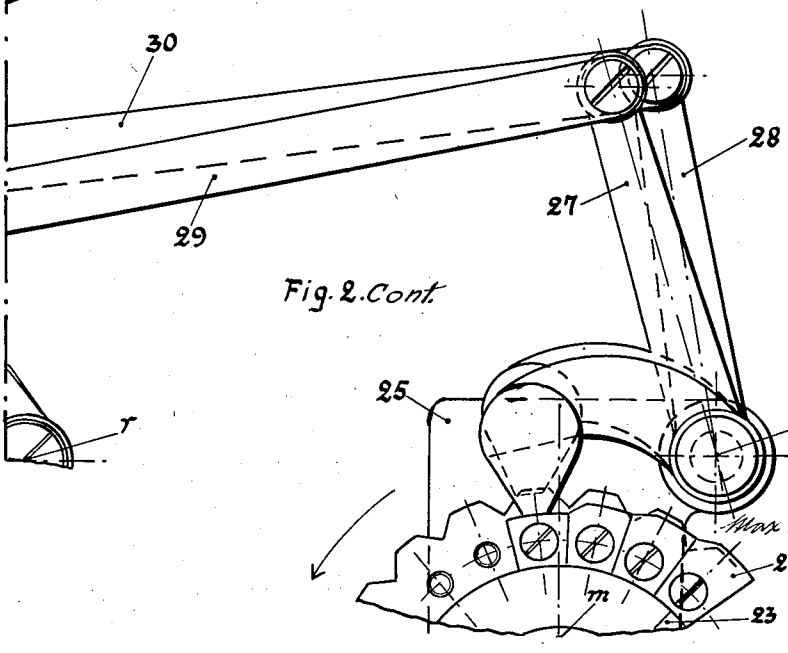


Fig. 2. Cont.

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REVERSE PLATING KNITTING MACHINE

Filed June 8, 1928 4 Sheets-Sheet 3

Fig. 3.

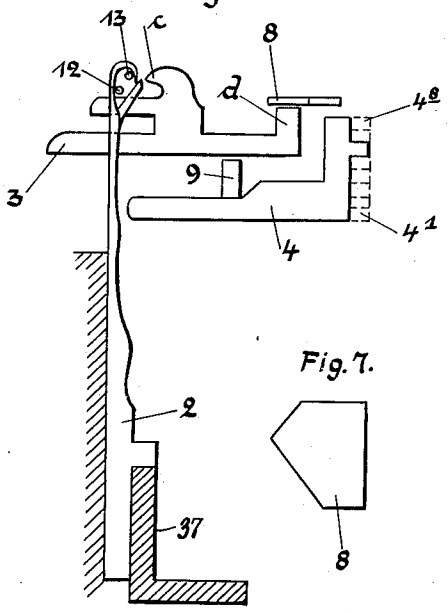


Fig. 7.

Fig. 4.

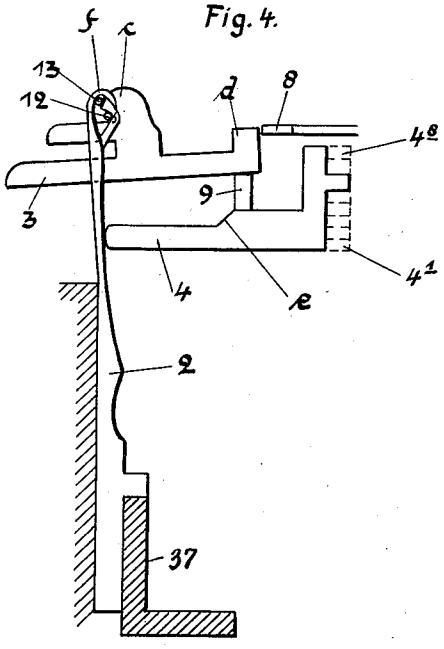


Fig. 12.

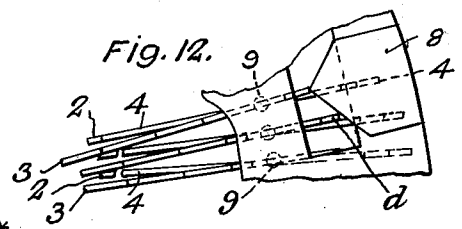


Fig. 5.

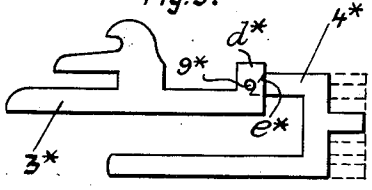




Fig. 6.

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March 26, 1940. M. C. STEINMUELLER 2,194,485

REVERSE PLATING KNITTING MACHINE

Filed June 8, 1928 4 Sheets-Sheet 4

Fig. 9.

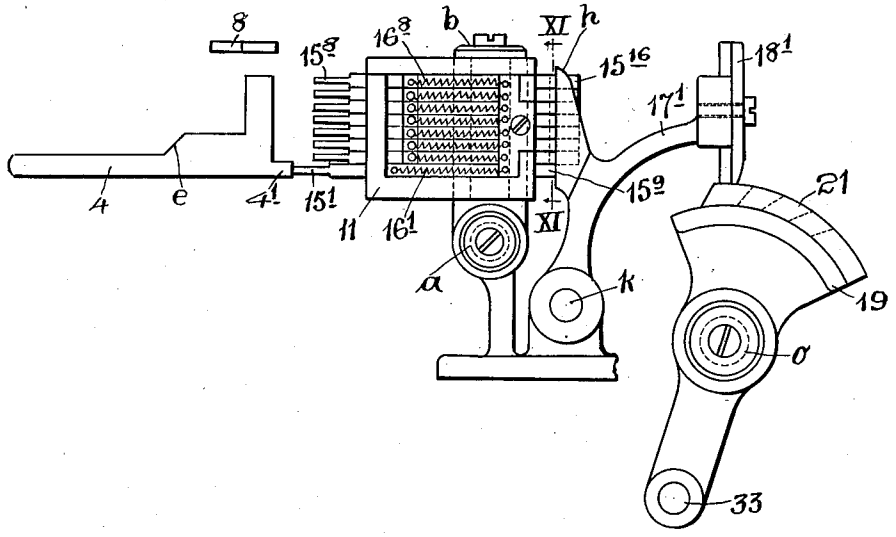


Fig. 11.

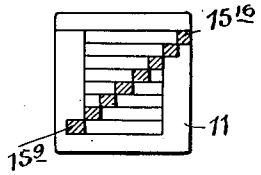
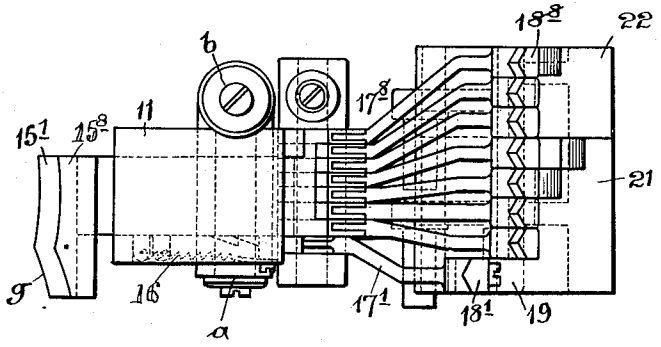


Fig. 10.



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Patented Mar. 26, 1940 2,194,485

UNITED STATES PATENT OFFICE

2,194,485

REVERSE PLATING KNITTING MACHINE

Max Carl Steinmueller, Chemnitz, Germany, assignor, by mesne assignments, to Hemphill Company, Pawtucket, R. I., a corporation of Massachusetts

Application June 8, 1928, Serial No. 283,826
In Germany July 20, 1927

10 Claims. (Cl. 66—36)

The present invention relates to the manufacture of fabrics by jacquard with reverse plated pattern in circular knitting-machines and circular stocking frames with an automatic adjustment.

The manufacture of reverse plated fabrics in circular knitting-machines is known and the characteristic feature of said fabrics resides in that the two working threads are reversed within the needle-head, just before said threads or yarns are worked up to or transformed into meshes, in such a manner that the ground thread rests on the upper surface of the fabric and the covering thread on the backward side of said fabric.

The means heretofore known for reversing the threads are different ones. In one case the reversing of the threads within the needle-head is obtained by sinkers, so-called reverse sinkers, the noses of which are of a peculiar shape for the purpose of displacing the ground thread. In another case needles are used for this purpose the heads of which are bent somewhat in a backward direction, whereby the change of the threads is obtained by the different position of the needle-heads.

An important feature of the present invention is seen in that the needles and the sinkers are used for an especially neat fabric tidily worked, patterned by jacquard and reverse plated; the needles are subject, when desired, to a radial displacement, while the sinkers may be advanced in such a manner that their noses displace the ground thread.

In the drawings annexed

Fig. 1 shows the apparatus partly in elevation, partly in section;

Fig. 2 is a top plan view of the apparatus shown in Fig. 1;

Fig. 3 shows the position of the needle, the sinker and the slider during the normal operation;

Fig. 4 the position of the needle, the sinker and the slider during the reverse plating work, as well as the indirect raising of the one side of the sinker by the pin 9 and

Fig. 5 the direct raising of the one side of the sinker by the nose of the slider (modified form).

Fig. 6 shows a plan of Fig. 5.

Fig. 7 is a plan of the sinker cam 8.

Fig. 8 is a detail of the pusher 15.

Fig. 9 shows the position of the parts during the reverse plating operation.

Fig. 10 shows a top plan view of a portion of Fig. 9.

Fig. 11 is a section through the projecting pins 15^9–15^{16} taken along the line XI—XI of Fig. 9, looking in the direction of the arrows, and

Fig. 12 represents a top plan view of the apparatus shown in elevation in Figs. 3 and 4.

The ring for guiding the sinkers is arranged on the needle-cylinder 1 and consists of two parts, viz. the guiding-ring 5 proper and the lower part 6 provided with slots of a number equal to those of the upper part, with the difference only that the slots of the lower part are offset half a division for the reason that the sliders act against the needles while the sinkers act upon the threads situated between the needles. The connection between the two parts 5 and 6 is secured by the key 10 shown in Fig. 1.

During plating work two threads, viz. the ground thread and the covering thread, are supplied to the needle-heads. In Fig. 3 is shown the manner in which, for the working of smooth plating fabric, the needles, sinkers, sliders, as well as the two working threads are positioned one to another. The covering thread 12 is within the needle-head and below the ground thread, in contact with the inner edge of the upper needle-end. The ground thread 13 however is situated above the covering thread and nearly at the front part of the needle-hooks. If the two threads are worked in this position, Fig. 3, to form meshes, the ground thread rests on the inner side of the fabric and the covering thread on the front and outer side of the fabric. During said normal working procedure the needle-head is not bent back, the slider 4 is situated at a distance from the neck of the needle, the sinker 3 is in a precisely horizontal position, the sinker-nose *d* slides below the sinker cam 8 and the sinker is not advanced.

The operation for a reverse plating, viz. the operation for the production of patterns is represented in Figs. 4 and 9. By the pusher 15 (Figs. 1 and 8) the slider 4 has partly sunk the loop, said slider is in contact with the neck of the needle 2 and has also pushed the needle-head back a little. By partly sinking the slider 4 the pin 9 or 9*, which can be arranged as an independent part (Figs. 1, 3 and 4) or as a part of the reverse sinker 3 (Figs. 5 and 6), has been displaced by the slanting edge *e* or *e** of the slider in an upward direction, whereby also the nose *d* or *d** of the sinker 3 or 3* has been raised so as to be within the range of the sinker cam 8. The sinker 3 has been advanced by said cam 8 whereby the nose *c* of the sinker 3 touches the ground thread 13 and pushes back said thread. By pushing back the needle-head *f* caused by the slider 4 the covering

thread 12 has left the needle-head and is enabled to place itself during the formation of meshes or loops in rear of the ground thread 13. The ground thread appears in the finished fabric on the upper surface and the covering thread on the lower side.

This operation may be further illustrated by referring to Fig. 12, where it will be seen that a reverse sinker 3, at the top has been raised by its slider 4 and pin 9 and advanced by the sinker cam 8, as shown in Fig. 4, while other sinkers 3 not raised by their sliders 4 and pins 9 are in their normal withdrawn position, as shown in Fig. 3. The sinkers 3 lie between the needles 2 and do not touch them, whereas the sliders 4 are disposed at a slight angle so that their inner ends will contact with the needle shank when the slider is advanced.

A form of construction which may be considered as an example for the automatic adjustment is given by the following:

The slider 4 is provided at the end at which the sinking of the loops takes place with rearranged pins 4^1 to 4^8 (in the example represented there are 8 pins). Corresponding to the number of said pins, pushers, for the purpose of sinking the loops on the sliders 4, are provided within the movable box 11. Said pushers 15^1 to 15^8 are arranged flatwise one above another. Sideways of each pusher a spring 16^1 to 16^8 is arranged for returning said pushers into the position of rest. The pusher 15, Fig. 8, consists of the end portion *g* causing the sinking of the loop, the middle-piece *i* and the end part carrying one or more pins 15^9 to 15^{16}. The box 11 containing the pushers can be swiveled vertically around the axis *a* and horizontally around the axis *b*. The carrier 14 containing the lock-boxes serves as a support for the other end of the box 11. The possibility of swiveling the latter is of importance inasmuch as the position of the pushers 15 in relation to the sliders 4 is not altered by the raising and lowering of the needle-cylinder 1. The displacement of the pushers 15^1 to 15^8 into the position of operation is caused by the levers 17^1 to 17^8 swinging around the axis *k* and carrying the noses *h* against the pins of the pushers. Small adjustable iron bars or fingers 18^1 to 18^8 are arranged on the other ends of said levers for a precise adjustment and are actuated by the cams 21 and 22 carried by the segmental levers 19 and 20. The movement for operating the segmental levers is derived from two ratchet-discs 23 and 24, Figs. 1 and 2, supported on the small trestle 25 and rotating around the axle *m*. The movement of the ratchet-discs is effected by a mechanism not especially shown in the drawings. In order to effect the desired turning movement of the segmental levers, cam blocks 26 of various selected heights are screwed on the ratchet-discs. The connection between the ratchet-disc 23 and the segmental lever 19 is secured by the bell crank structure 27 turning round the axle *n*, and adapted to reciprocate the rod 29 so as to move, through the connection *q*, the arm 31 (pivotally supported at *r*). The free end of the arm 31 bears a pin 32 which contacts with the pin 33 of the segmental lever 19 whereby it may turn the latter to an extent determined by the height of the wedge 26. The backward movement of the segmental lever 19 is ensured by the coiled spring 35. The connection between the ratchet-disc 24 and the segmental-lever 20, through bell crank lever 28 and rod 30, is similar and can be seen without any difficulty on the drawings with the aid of the foregoing explanation.

From the foregoing it will be apparent that selective control of the sinkers and needles for producing any desired design, entirely without alteration or replacement of the sinkers and needles, is secured simply by arranging the cam blocks 26 so as to move the segmental levers 19 and 20 a suitable distance. Additionally, by varying the arrangement of pins 15^9–15^{16} and of pushers 15^1–15^8 it will be seen that any of the levers 17^1–17^8 may be made to actuate any one or more of the pushers, hence complete sinker and needle control is obtained by means of a series of devices having somewhat the action of the conventional jacquard mechanism.

With the form of needles and needle mounting heretofore known any arrangement wherein the needle head was moved radially inward by flexing the needle shank has involved the danger of displacing outwardly the bottom end of the needle, and this has been so notwithstanding the use of ordinary retaining springs such as are indicated at 36, Fig. 1, these being usually located at or above the middle of the needles. In order to obviate this difficulty the needles shown herein (Figs. 1, 3 and 4) have their lower parts considerably thickened in a radial direction so that these parts will not bend easily, and special means is provided to prevent the lower ends of the needles from springing out of their grooves, this means including a band 37 positioned outside the needle circle and adjacent the lower part of the needles so as to restrain the bent-in needles, as well as the needles adjacent thereto, from springing out of their grooves.

What I claim is:

1. In an apparatus of the character described, a single set of sinkers adapted for normal and reverse plating, means for raising an end of said sinkers, a cam positioned normally above the ends of the sinkers and shaped to advance the sinkers in their reverse plating position when said ends are raised.

2. In an apparatus of the character described, a single set of sinkers adapted for normal and reverse plating, a set of needles between said sinkers, a set of sliders also between said sinkers and provided with a projecting portion in register radially with said needles, means for actuating said sinkers and needles independently of the sliders for normal plating, and means adapted to selectively actuate said sliders for displacing the needles and raising the sinkers into position for reversing the threads within the needle heads.

3. In an apparatus of the character described, a single set of sinkers adapted for normal and reverse plating, a set of needles between said sinkers, a set of sliders each provided with a slanting surface, and means for raising the sinkers when the sliders are advanced, said means being adjacent the slanting surfaces and adapted to coact therewith.

4. In an independent needle knitting machine having knitting instrumentalities consisting of needles and sinkers, and having means to actuate the needles, means to actuate the sinkers, and including a sinker cap providing a cam way for the said sinkers, a cam included in the said cam way for normally moving the sinkers forward, a single second cam therein adapted to give to selected ones of the said sinkers early forward movements to accomplish a desired purpose, butts associated with the sinkers and normally out of position to be engaged by the said second cam,

and means adapted to cause the said butts to be positioned at a level to be engaged and actuated by the said second cam.

5. A knitting machine having needles and sinkers mounted therein for independent movements, the movements of the sinkers being substantially at right angles to the movements of the needles, a cam and means for selectively acting upon the sinkers selectively to effect special preparatory movements thereof, said means when acting upon the sinkers causing selected ones of them to be in a position to be thereafter actuated by the cam, said cam acting upon the selected sinkers to impart special movements thereto substantially at right angles to the direction of movement of the needles and at right angles to the aforesaid preparatory movements of the sinkers.

6. A knitting machine having needles and sinkers mounted therein for independent movements, the movements of the sinkers being substantially at right angles to the movements of the needles, a cam and means for selectively acting upon the sinkers selectively to effect special preparatory movements thereof, said means when acting upon the sinkers causing selected ones of them to be in a position to be thereafter actuated by the cam, said cam acting upon the selected sinkers to impart special movements thereto substantially at right angles to the direction of movement of the needles and at right angles to the aforesaid preparatory movements of the sinkers to change the plating relation of the yarns in the hooks of the needles.

7. A knitting machine having a needle bed, needles and cooperating instrumentalities independently mounted therein and bodily movable at right angles to the needles, means including a cam for selectively controlling the movements of the said instrumentalities to effect stitch variation, the said means including members for selectively causing the instrumentalities to be positioned or not to be positioned at different elevations for engagement by the said cam, the movement of the selected instrumentalities by the cam effecting stitch variation, the instrumentalities and actuating means therefor being located on the same side of the needle bed.

8. A knitting machine having a needle bed, needles and cooperating sinkers independently mounted therein and bodily movable at right angles to the needles, means including a cam for selectively controlling the movements of the said sinkers to effect stitch variation, the said means including members for selectively causing the sinkers to be positioned or not to be positioned at different elevations for engagement by the said cam, the movement of the selected sinkers by the cam effecting stitch variation, the sinkers and actuating means therefor being located on the same side of the needle bed.

9. A knitting machine having a needle bed and needles mounted therein for independent sliding movements, sinkers movable independently and substantially at right angles with respect to the needles selectively so to position yarns in the hooks of needles as to effect the knitting of normal or reverse plated stitches as desired, means for selectively controlling the aforesaid movements of the said sinkers, said means including a cam and members selectively acting upon the said sinkers to cause them to be positioned or not to be positioned at different elevations so as to be or not to be engaged by the said cam, the engagement of said sinkers by the said cam causing said sinkers to move in the direction of the needles and act upon the yarns in such a manner as to effect normal or reverse plating as desired at selected wales.

10. An independent needle knitting machine, needles independently movable therein, two threads being fed to the needles in a plating relation, members transversely slidable with respect to the said needles and adapted to cooperate therewith selectively to reverse the plating relation of the threads, means adapted selectively to position the said members at different levels and thereafter to impart other movements to certain of the said members, whereby to cause reversal in the plating relation at certain wales as desired.

MAX CARL STEINMUELLER.